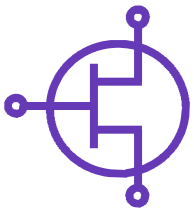
MESFET MODEL

HMT-TQT-TGA2602-SM

Model Features

- Broadband (DC-6GHz)
- Non-linear (Angelov model)
- Measurement validations:
  - DCIV
  - Multi bias S-parameter
  - Noise parameters
  - Single tone Power sweep (0.9 and 1.9GHz)
  - Two tone Power sweep (0.9 and 1.9GHz)
  - Load pull (0.9 and 1.9GHz)



TriQuint TGA2602-SM
Packaged pHEMT

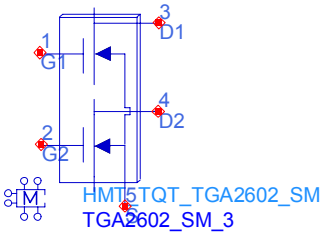
Model Description

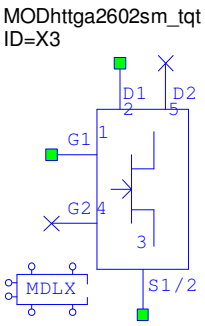
The HMT-TQT-TGA2602-SM is a non-linear model for the packaged pHEMT device based on the extraction of Angelov model. The model is intended for use with microstrip applications operating from DC to 3 GHz. The device is designed for use in wireless base station and WiMAX application and other commercial systems.

Technical Notes

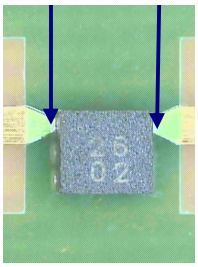
- The non-linear model is extracted from DCIV and multi-bias S-parameter measurements
- The non-linear model is also used to simulate noise parameters.
- The model has been validated with measurements over the frequency range DC to 6 GHz in a single channel and a common source configuration.
- The model biad points tested include Vds=2V, Ids=40mA and Vds=4V, Ids=50mA.
- Via-grounding effects are included.
- The substrate used to extract the model: 20mil FR4

Model Representation



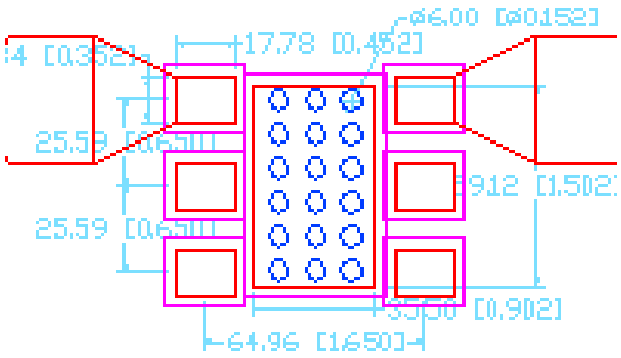


Layout and Reference Planes



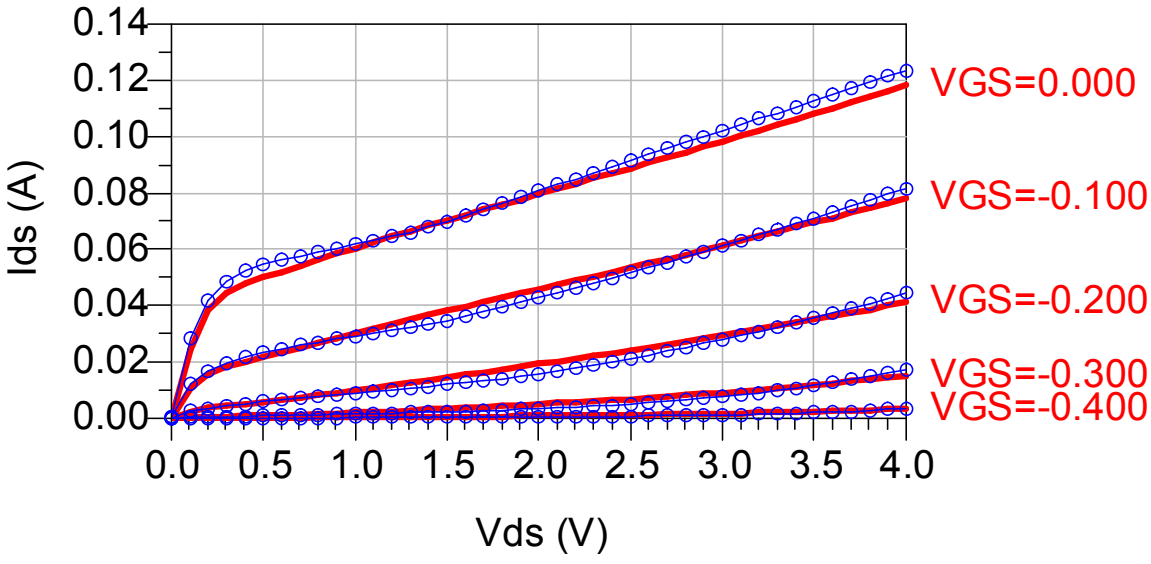
Please see the next page of layout information

Test Layout



Note: units are mils (mm)

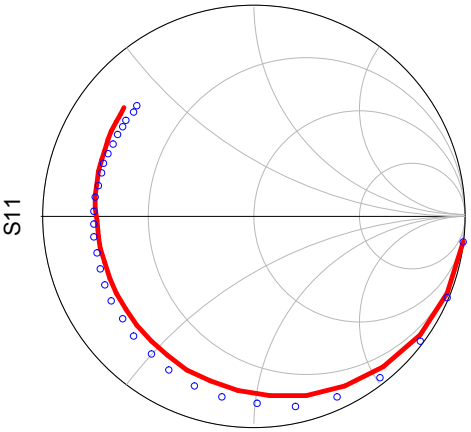
DCIV Characteristics (25C)

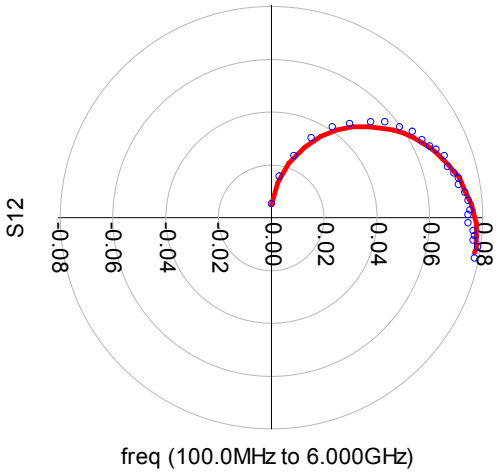


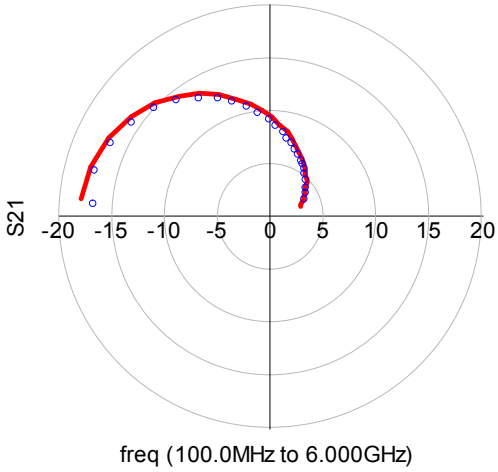
Legend: Solid Red lines-Model, dashed lines with Blue o markers-Measured data

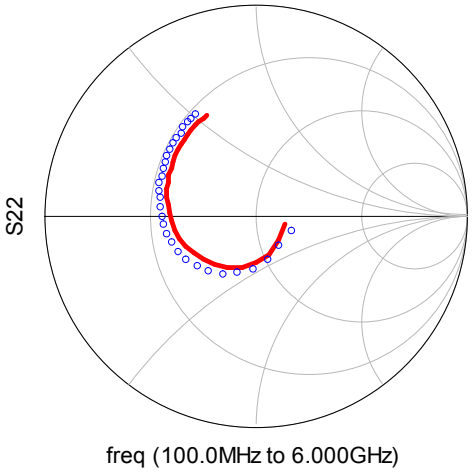
Simulated at T=25C with VGS varying from –0.4 to 0V in steps of 0.1V and VDS=0~4V

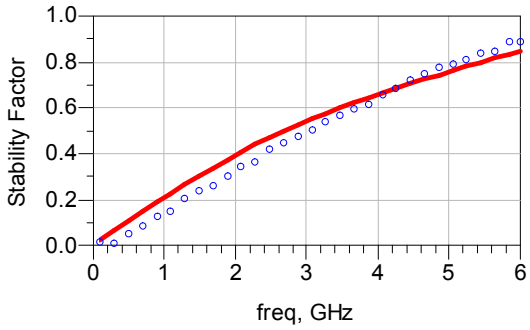
Bias Dependence at 25C

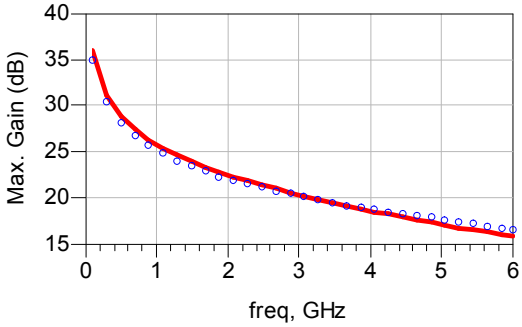








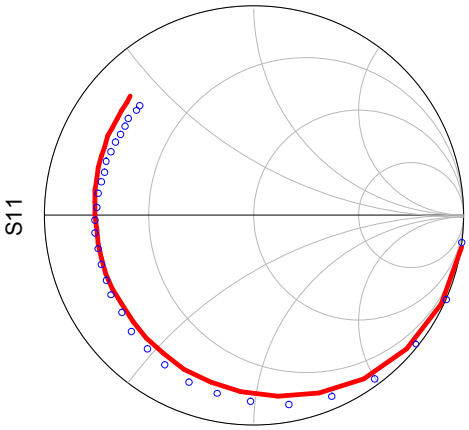


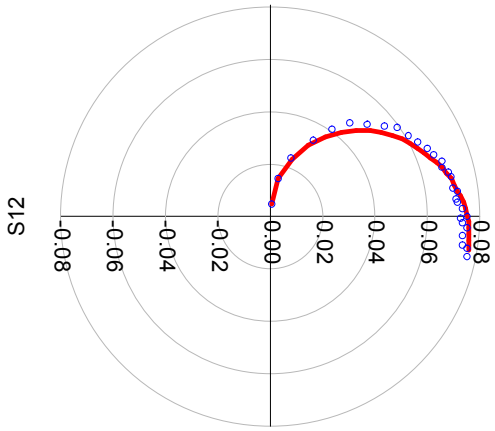


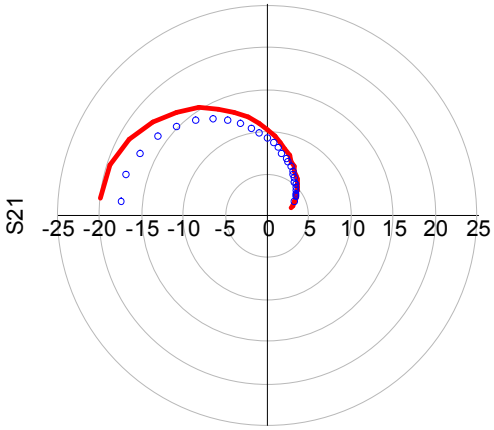
Legend: Solid Red lines-Model, dashed lines with Blue o markers-Measured data

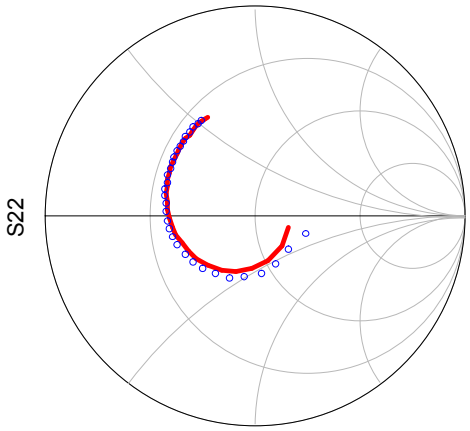
Bias condition: Vds=2V for Ids=40mA.
Frequency range is 0.1 to 6 GHz.

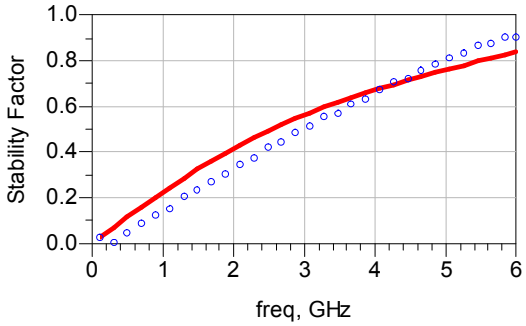
Bias Dependence at 25C

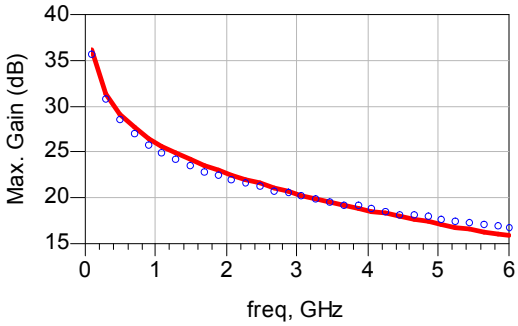








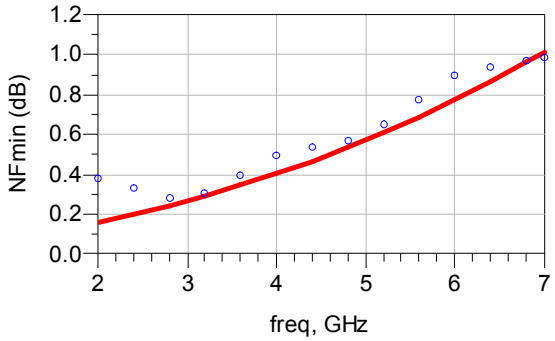


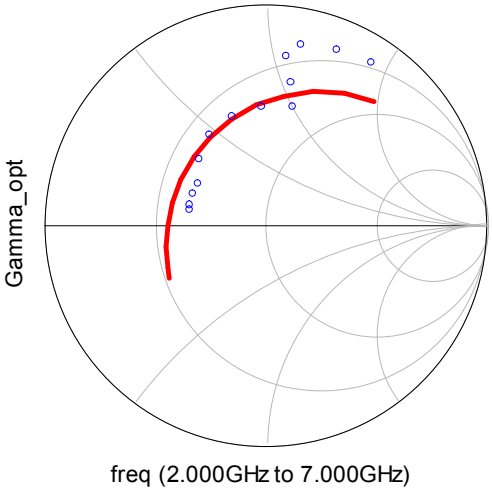


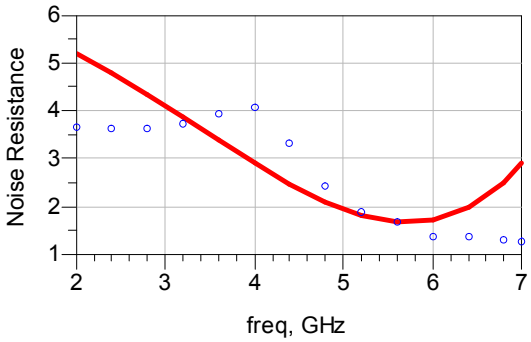
Legend: Solid Red lines-Model, dashed lines with Blue o markers-Measured data

Bias condition: Vds=4V for Ids=50mA.
Frequency range is 0.1 to 6 GHz.

Noise parameter (25C)



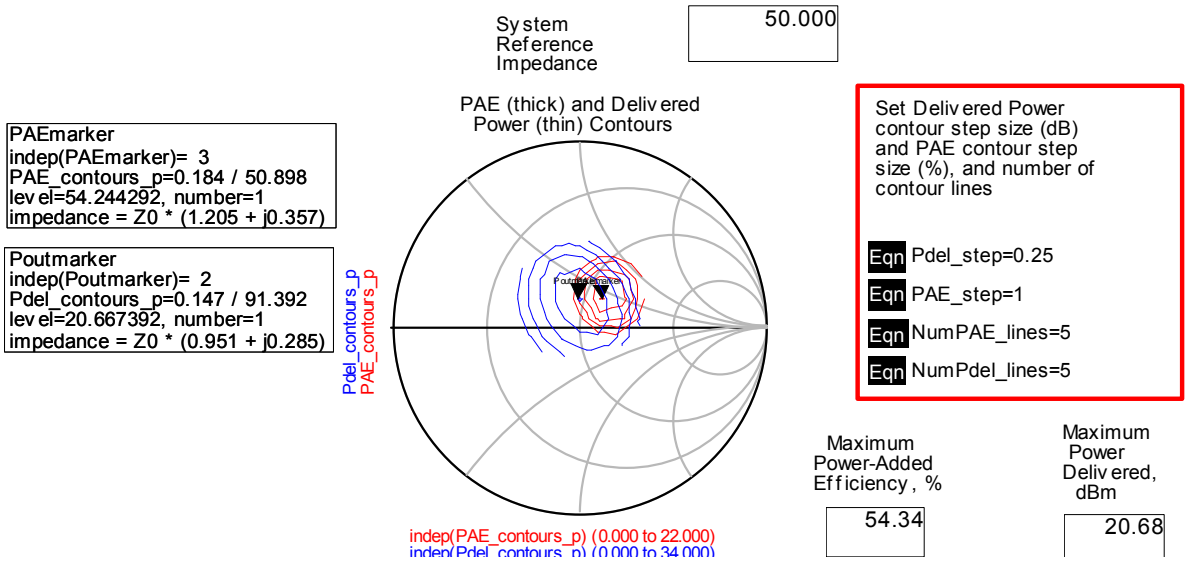




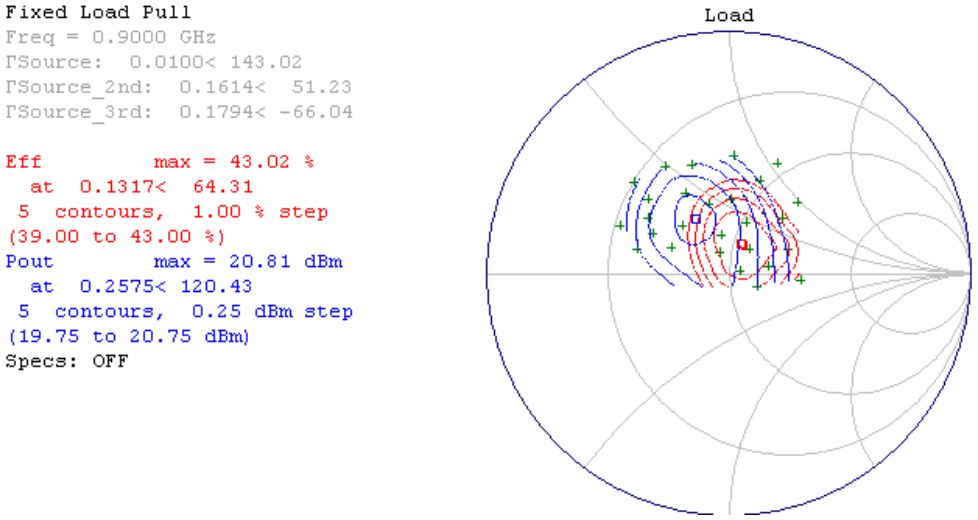
Legend: Solid Red lines-Model, dashed lines with Blue o markers-Measured data

Model and measured noise parameter at
the bias condition: Vgs=-0.18V and Vds=4V (Ids= 50mA).
Frequency range is 2 to 7 GHz.

Load Pull Validations (f=900MHz)



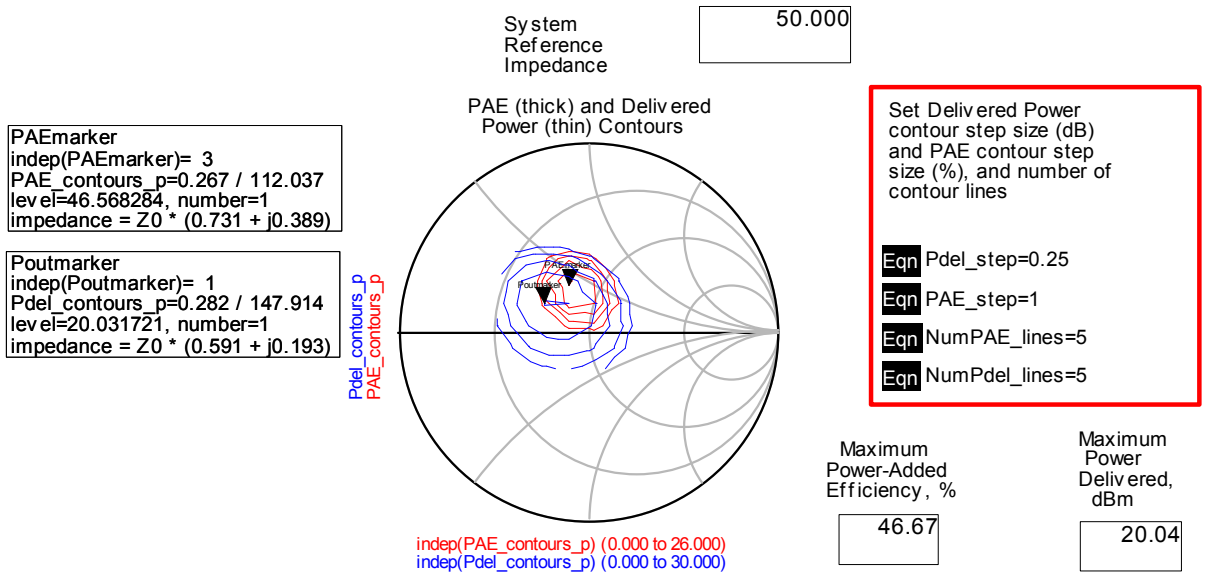
Delivered power (blue) and PAE (red) contours for model (top) and measurement (bottom)



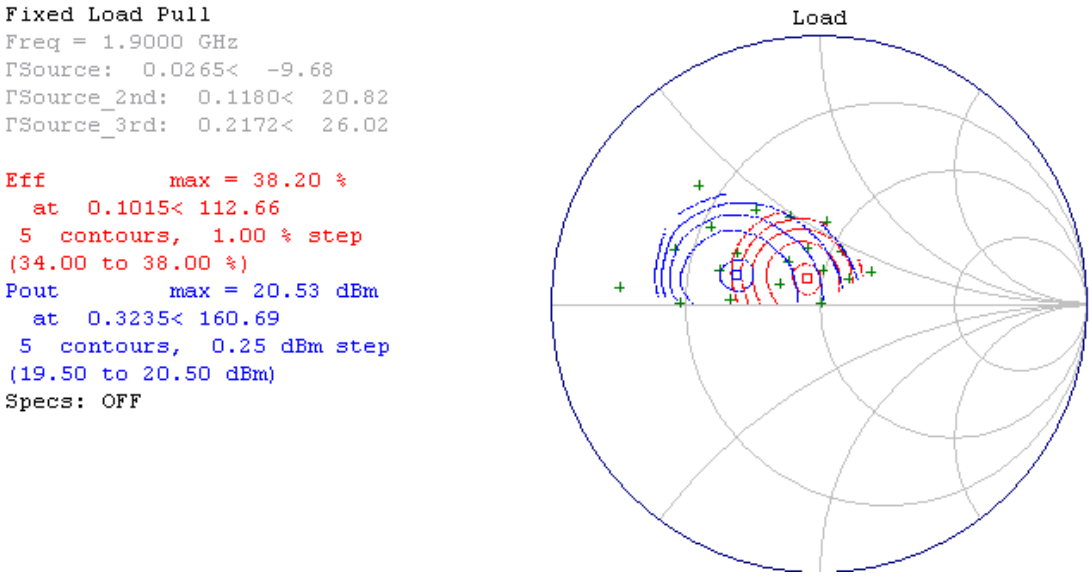
	Load impedance at max. PAE	Max. PAE Value (%)	Load impedance at Max Pout	Max Pout Value (dbm)
Measured	58.2+j12.05	43.02	31.95+j13.7	20.81
Model	60.2+j21.3	54.34	50+j11.65	20.68

Comparison of load pull between the measurement data (**bottom**) and the model performance (**top**). The bias conditions: Vgs=-0.18V and Vds=4V, the input power=-2dBm, the frequency 900MHz, and source impedances at 49.2+j0.6 Ohm.

Load Pull Validations (f=1900MHz)



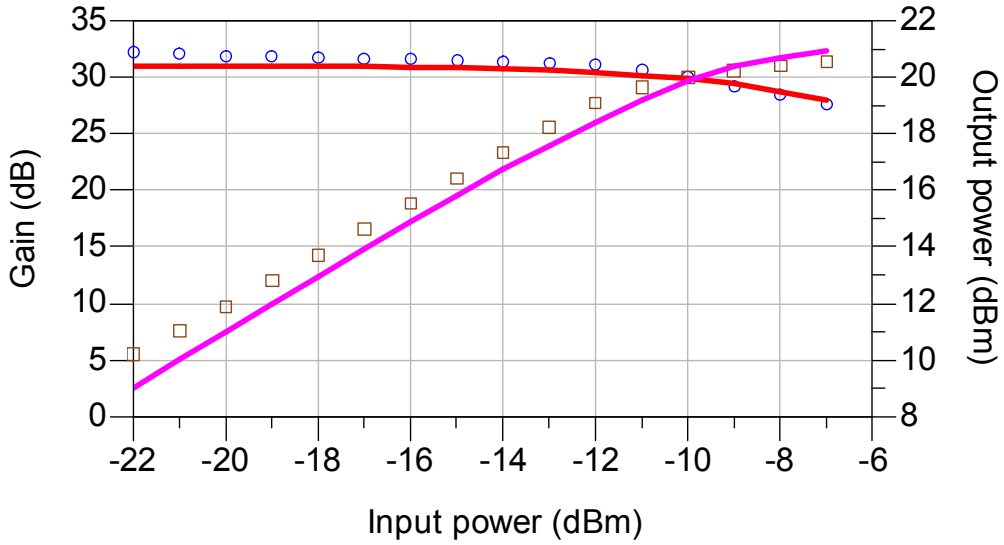
Delivered power (blue) and PAE (red) contours for model (top) and measurement (bottom)



	Load impedance at max. PAE	Max. PAE Value (%)	Load impedance at Max Pout	Max Pout Value (dbm)
Measured	45.5.2+j8.4	38.2	25.7+j6.2	20.53
Model	36.5+j19.4	46.67	29.5+j9.6	20.04

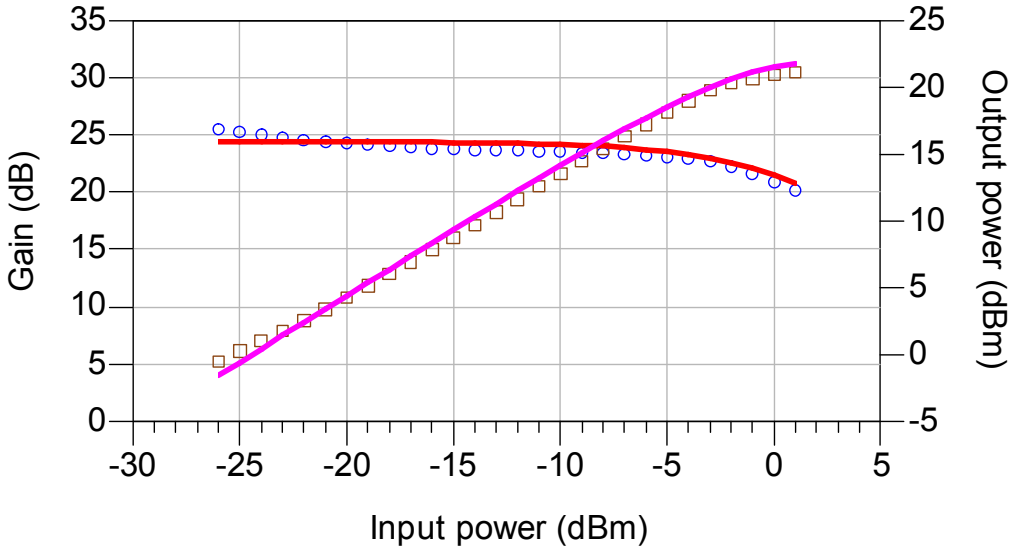
Comparison of load pull between the measurement data (**bottom**) and the model performance (**top**). The bias conditions: Vgs=-0.18V and Vds=4V, the input power=0dBm, the frequency 1900MHz, and source impedances at 52.79-j0.9 Ohm.

Single tone power sweep (f=900MHz)



Legend: Solid lines-Model, markers-Measured data
○ -Gain Compression, □ -Output power

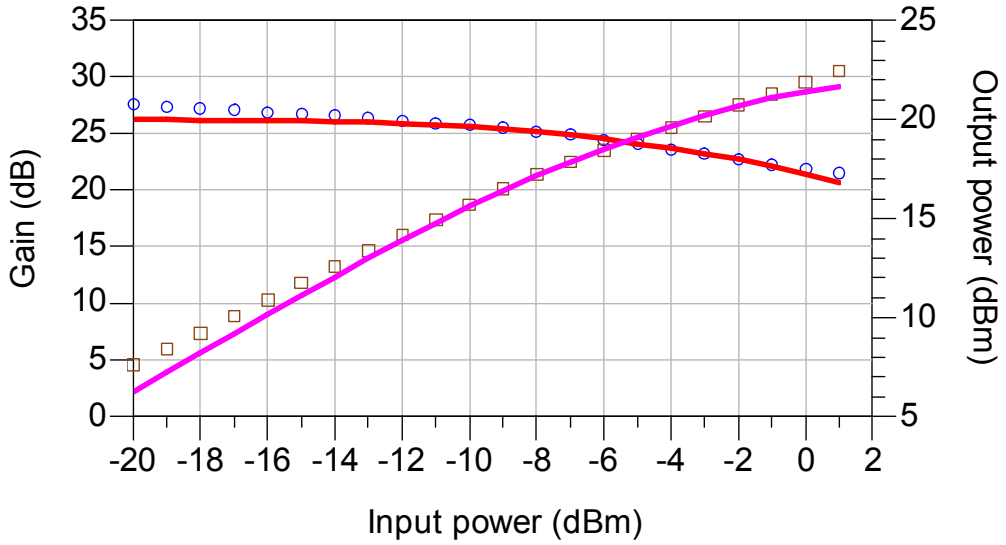
Simulated and measured with source impedance at 39.82+j59.79 ohms and load impedance at 36.71+j22.88 ohms. An input frequency of 900 MHz.
The bias condition: Vgs=-0.18V and Vds=4V (Ids~50mA)



Legend: Solid lines-Model, markers-Measured data
○ -Gain Compression, □ -Output power

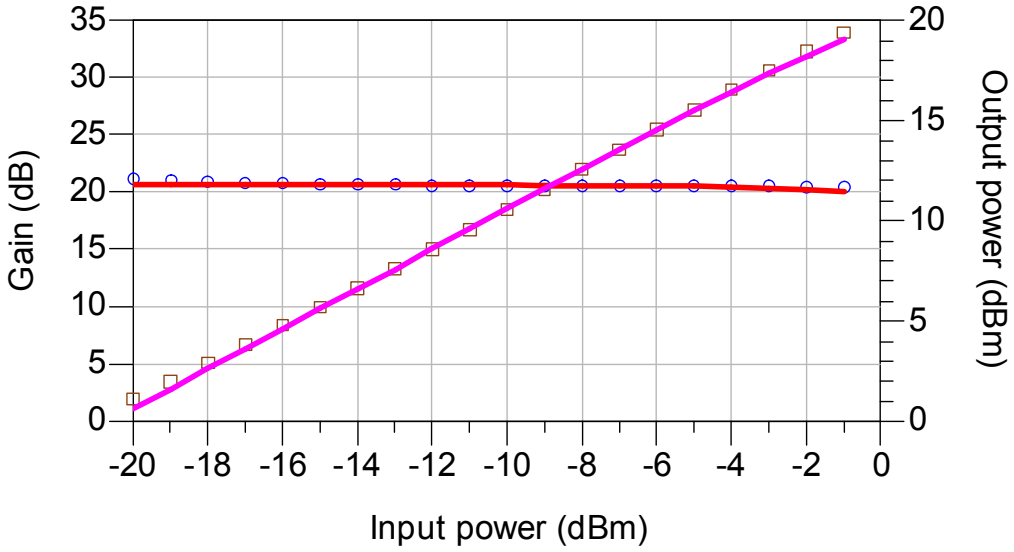
Simulated and measured with an input impedance at 50 ohms and the output impedance at 50 ohms. An input frequency of 900 MHz.
The bias condition: Vgs=-0.18V and Vds=4V (Ids~50mA)

Single tone power sweep (f=1900MHz)



Legend: Solid lines-Model, markers-Measured data
○ -Gain Compression, □ -Output power

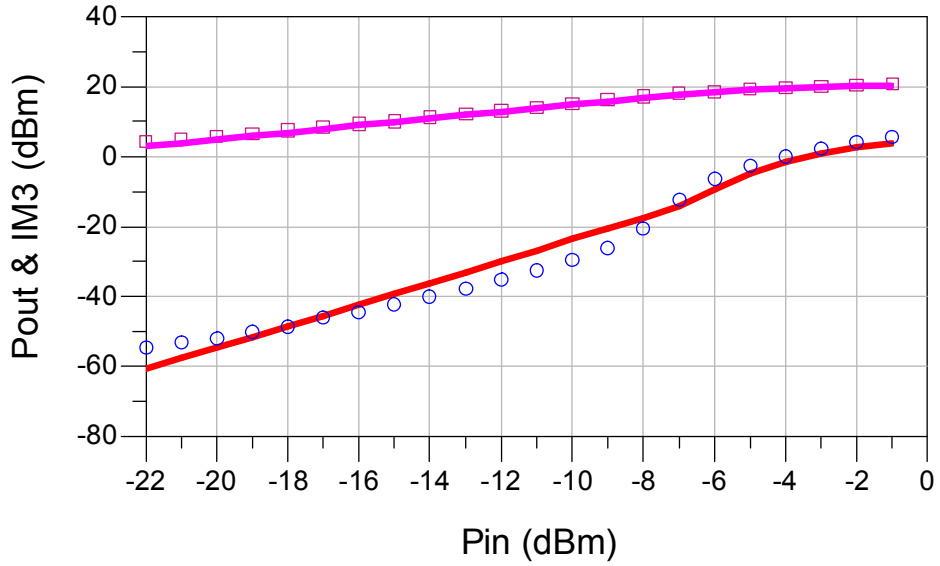
Simulated and measured with source impedance at 15.5+j19.9 ohms and load impedance at 22.4+j6.54 ohms. An input frequency of 1900 MHz. The bias condition: Vgs=-0.18V and Vds=4V (Ids~50mA)

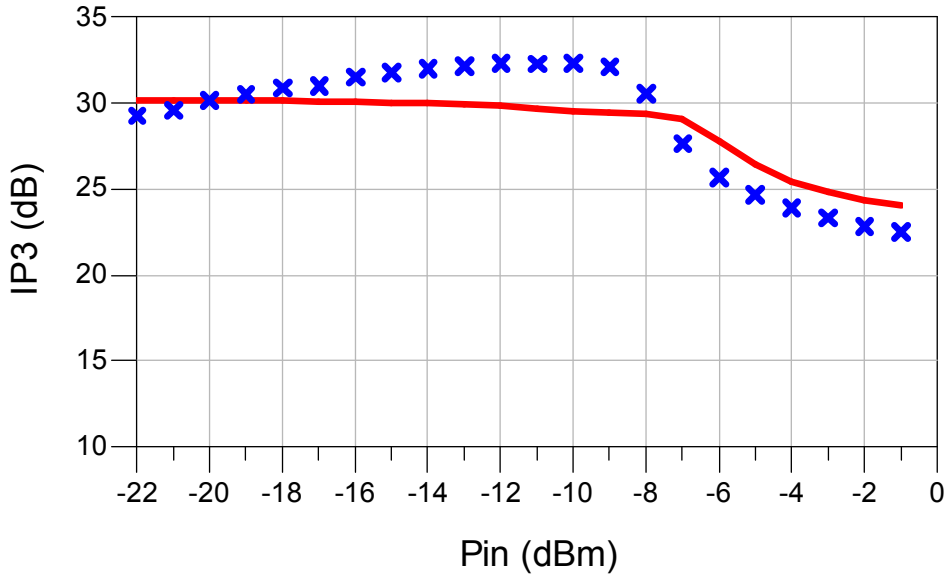


Legend: Solid lines-Model, markers-Measured data
○ -Gain Compression, □ -Output power

Simulated and measured with an input impedance at 50 ohms and the output impedance at 50 ohms. An input frequency of 1900 MHz. The bias condition: Vgs=-0.18V and Vds=4V (Ids~50mA)

Third order inter-modulation (IP3 and IM3) (f=900MHz)

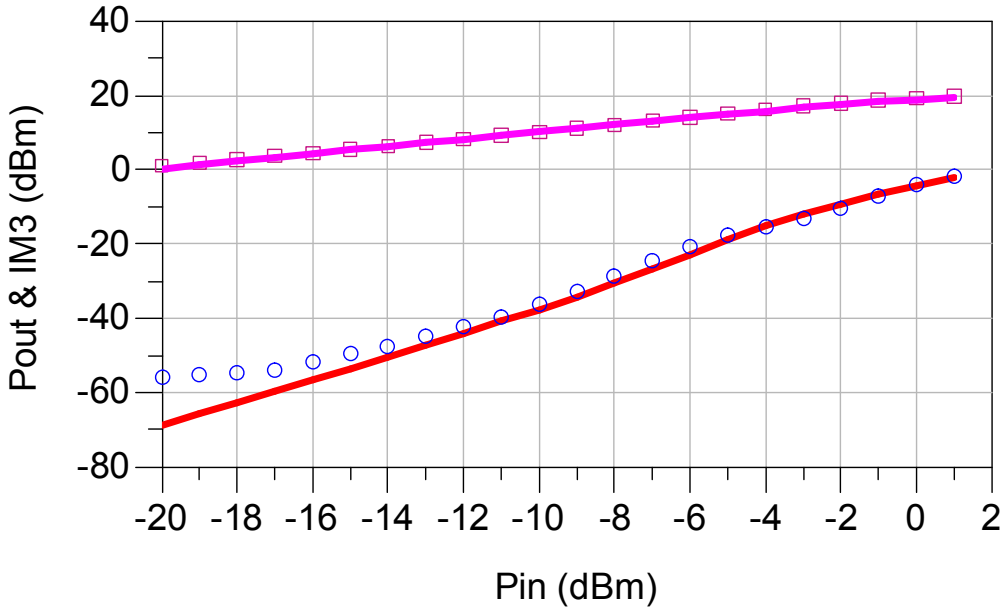


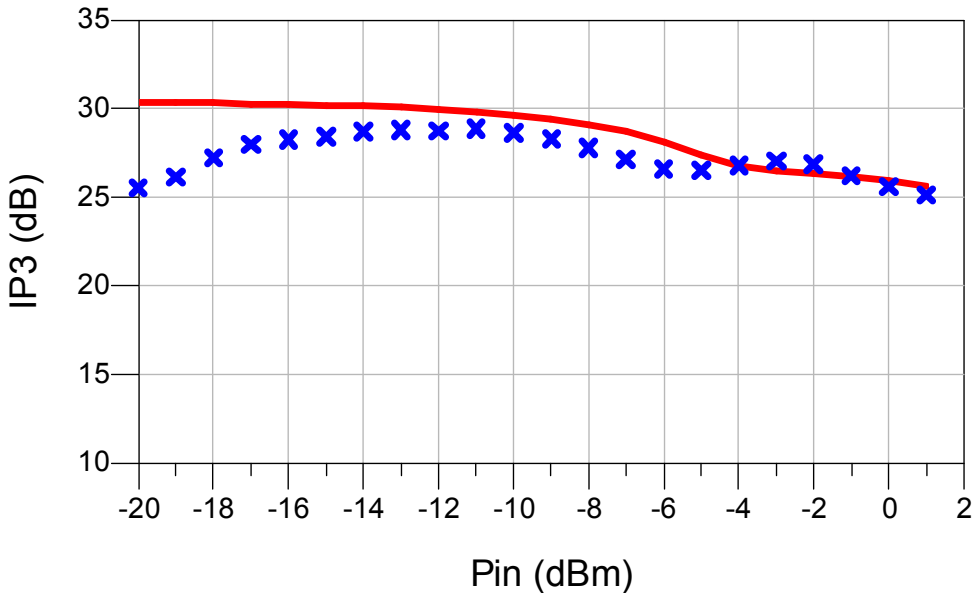


Legend: Solid lines-Model, markers-Measured data
○ –IM3, □ -Output power, X - IP3

Simulated and measured with source impedance at 131+j88.47 ohms and load impedance at 36.71+j22.88 ohms. An input frequency of 900 MHz.
The bias condition: Vgs=-0.18V and Vds=4V (Ids~50mA)

Third order inter-modulation (IP3 and IM3) (f=1900MHz)





Legend: Solid lines-Model, markers-Measured data
○ –IM3, □ -Output power, X - IP3

Simulated and measured with source impedance at 88.53+j26.87 ohms and load impedance at 22.4+j6.54 ohms. An input frequency of 1900 MHz. The bias condition: Vgs=-0.18V and Vds=4V (Ids~50mA)